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# IBM® Office Products Division Customer Engineering

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DIAGNOSTIC AIDS  
"Selectric" Composer

## DIAGNOSTIC AIDS

The flow charts and functional tests that follow are presented as an aid to the Customer Engineer in defining and diagnosing failures in high service mechanisms of the "Selectric" Composer.

These functional test procedures are to be used when checking a mechanism that is failing intermittently or checking the reliability of a mechanism that has been repaired. It should be understood that they are not a functional test procedure to follow each inspection or service call and that the tests do not cover every mechanism.

The diagnostic flow charts are intended to serve only as a guide when troubleshooting a problem. True, it is not always possible to logically troubleshoot a problem in some mechanisms, especially the escapement system; however, these flow charts should direct the C.E. to the most probable cause of failure.



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## DIAGNOSTIC AIDS

The flow charts and functional tests are presented as aids to the Customer Engineer in diagnosis and repair of various mechanical and electrical malfunctions.

These functional tests are designed to be performed by the Customer Engineer in the field. They are not intended to be performed by the factory service personnel. It is the policy of International Business Machines Corporation that the Customer Engineer should be able to perform the majority of the diagnostic and repair work on the machine.

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Printed in U.S.A.

December, 1967

## FUNCTIONAL TEST

Customer Engineer  
Checklist  
Instructions  
Index

## CARRIER RETURN

## FUNCTIONAL TEST

- A. Check to see if lead screw is home before carrier return unlatches.
1. Set LH margin away from zero; Pitch Selector on 1/96 pitch.
  2. Type lower case "wm" (15 units).
  3. Return the carrier.
  4. Repeat this procedure several times. *Watch for uneven left hand margin.*
- B. Check for proper latching and unlatching of carrier return.
1. Set LH margin at zero.
  2. Tab carrier to the right.
  3. Operate carrier return while holding the carrier.
  4. Let the carrier move slowly into overbank.
    - a. *Carrier return should unlatch just before carrier reaches full overbank.*
    - b. *Pointer should indicate zero after carrier return unlatches.*

## CHARACTER BACKSPACE

## FUNCTIONAL TEST

- A. Check for extra units.
1. Set the LH margin at zero.
  2. Place the Pitch Selector in 1/72 pitch.
  3. Return the carrier and type four upper case "M's".
  4. Return the carrier and type one upper case "M".
  5. Operate the character backspace twice.
  6. Strike two upper case "M's". *The first "M" should be 9 units into overbank and the second "M" should strike over the "M" at the left hand margin. Repeat several times.*
- B. Check for sufficient drive (CAUTION: This test should not be made near LH margin).
1. Set the LH margin on 0, the RH margin on 36; position the carrier on 30.
  2. Strike two lower case "m's", unit backspacing after the second "m".
  3. Strike five more "m's", unit backspacing after each one.
  4. Operate the character backspace once. *The carrier should backspace to the second "m". No hesitation should be seen in the carrier motion.*
- C. Check for intermittent failure of the character backspace.
1. Remove the cover; tab the carrier away from the left margin.
  2. Set all the pins by holding your finger against the right side of the pinwheel while turning the leadscrew bias gear top to the front of the machine until all the pins are set.
  3. Operate the character backspace. *Observe the pinwheel for single operation each time the character backspace keybutton is depressed. Operate the character backspace until the pinwheel has rotated 360 degrees.*

## TABULATION

## FUNCTIONAL TEST

- A. Latching out of tab lever on a long tab operation.
1. Set the LH margin on zero; RH margin on 40; set a tab stop at 37 (all other tab stops cleared).
  2. Return the carrier to the left hand margin. Operate the tab once. *The carrier should move to position 37. Operate the tab once more and the carrier should move to position 77.*
- B. Check tab brake and cord tightener.
1. Return the carrier and operate spacebar once.
  2. Hold the bias rewind gear and operate the tab. *There should be less than 1/32 motion to the right by the carrier.*  
NOTE: The bias rewind gear may be held without removing the covers by raising the left hand saddle cover and placing your index finger against the outer periphery of the gear.
  3. Repeat this test to check both lobes of the cam.
  4. Place pitch selector in 1/96 pitch; depress the Tab Locate Button; return the carrier and type lower case "mn" and tab alternately. *Carrier should stop at every other tab stop. This will test brake unlatching with 1 unit homing.*
- C. "Short" and "Long" tab.
1. Set eight or ten tab stops at random across the writing line.
  2. Place the pitch selector in 1/72 pitch.
  3. Depress the Tab Locate button.
  4. Type the character "M" at the LH margin. *A single tab operation should move the carrier to the next tab stop (3 units away). Continue to type "M" and tab alternately. The carrier should stop at every tab stop, set or cleared.*
  5. Place the pitch selector in 1/96 pitch and return the carrier. Repeat Step No. 4. Typing the "M" now places the carrier 7 units from the tab stop. *The "M's" in the second line should be in line with the "M's" in the line typed in Step No. 4. (Use the same font for both pitch selections.)*

## INTERLOCKS

## FUNCTIONAL TEST

- A. Carrier return to print.
1. Set LH margin to zero; tab carrier to right end of writing line. Return carrier and strike a character while carrier is returning. *The character should not print until carrier settles at LH margin.*
  2. Hold the spacebar in repeat and return the carrier. *No spacebar operation should occur during return, but the spacebar operation should resume when carrier return unlatches.*
  3. Depress carrier return button into repeat; strike a character. *The character should not print until carrier return keybutton is released.*
- B. Shift to print.
1. Strike each character in upper and lower case alter-



nately. Watch for keyboard lock-up or a delay in cycle clutch release.

**C. Unit backspace to print.**

1. Depress unit backspace into repeat; strike a character.  
*The character should not print until the unit backspace button is released.*

**D. Print to unit backspace.**

1. Hold spacebar into repeat; depress unit backspace button into repeat. *The backspace operation should interrupt the spacebar operation.*

**E. Character backspace to print.**

**CAUTION:** Carrier should be away from LH margin for this test.

1. Strike two lower case "m's"; backspace one unit. Strike five more "m's", backspacing one unit after each one. *This clears all pins but one.*
2. Depress the character backspace button.
3. Strike lower case "m" while the carrier is backspacing. This "m" should strike over the second "m".

**F. Backspace in overbank.**

1. Place pitch selector in 1/96 pitch.
2. Return the carrier.
3. Unit backspace twice. *The character backspace should not operate.*
4. Continue to backspace. *The unit backspace should be completely interlocked sometime before you are 9 units into overbank.*

**JUSTIFIER**

**FUNCTIONAL TEST**

**A. J-Tube indexing.**

1. Set the LH margin at zero and the pitch selector lever on 1/72 pitch; engage J-Lever.
2. Spacebar once and return the carrier. *Watch the J-Tube for a single index.*
3. Spacebar three times and return while watching the counter for proper indexing. Repeat several times.
4. Return the carrier and repeat spacebar until the pointer reaches:  
2 — Counter should read 8  
4 — Counter should read 16  
5 — Counter should read 20
5. Hold the justifier tube and operate the carrier return. Allow the justifier tube to slowly return from 20 to

zero.

**B. Step-Down**

1. Rotate quantity dial in both directions to check for binds.
2. Rotate value dial from 3 to 9 several times to check for binds.
3. Engage justification lever. *A positive detent should be felt as the lever is fully engaged.* Slowly move the value knob from 3 to 4. *The J-Lever must snap back to rest.*
4. Engage J-Lever again. *Value knob should move to 3.*
5. Repeat the above, moving the value knob to a higher setting each time (5, 6, 7, 8, and 9).
6. Set the LH margin on zero; pitch selector on 1/72 pitch, quantity dial on 20, and value knob on 3.
7. Return the carrier and repeat spacebar; when pointer reaches:  
2 — Quantity Dial should read 12  
4 — Quantity Dial should read 4  
5 — Quantity Dial should read 0
8. Quantity dial on 20 and value knob on 4; strike alternate spacebar and character until quantity dial reaches zero and value knob steps to 3. *Quantity dial must step down and detent after each spacebar operation, but no dial movement should be seen during the character print cycle.*

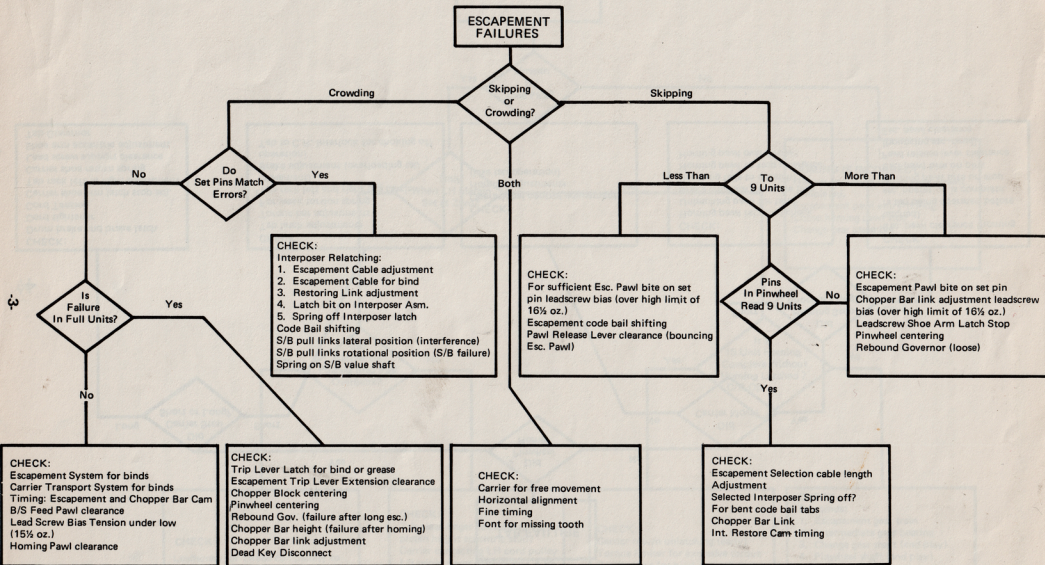
**C. Indicator tube returning to LH margin.**

1. Set tab stop at 40 and RH margin at 39.
2. Tab carrier to 40.
3. Carrier return while lifting on the right hand side of the ribbon feed plate. *The indicator tube should return to the left and the indicating pawl should latch it there.*
4. Repeat Step No. 3 with the margin on 12 and tab on 13; margin on 74 and tab on 75.

**D. Tube indication.**

1. Set RH margin on 39; tab stop on 36; spacebar value dial on 4, and pitch selector on 1/96.
2. Tab to 36; the white line should be on 48 (1/96 pitch window).
3. Spacebar once and white line should be on 44.
4. Continue to operate the spacebar in single operations. *The indicator tube should stop on multiples of 4 (40, 36, 32, 28, 24, 20, etc.)*
5. Repeat the above procedure with the margin at 12 and tab at 9; margin at 77 and tab at 74.

# ESCAPEMENT FAILURES



# TAB FAILURE

Did Pinwheel Home?

Yes

No

Did Carrier Stop Short or Long?

Long

Short

CHECK:  
Drum brake and brake latch  
Cord tightener  
Cord Tension  
Carrier shoe arm latch stop adj.  
Tab rack left to right adjustment  
Carrier shoe return spring  
Lead screw support clearance  
Shoe arm eccentric adjustment  
Tab Governor

CHECK:  
Tab latch adjustments  
Torque bar adjustments  
For weak torsion spring  
Tab rack left and right (no carrier movement)  
Brake adjustment (overloading tab operation)  
Tab to C.R. interlock for choking off

Did Carrier Move?

No

Yes

Did Homing Stop Short or Long?

Short

Long

CHECK:  
Homing pawl rebound check  
Unlatching pawl for bind  
Brake latch for excessive bite  
(Homing fails to unlatch)  
Homing pawl to stop clearance  
Homing pawl overthrow

CHECK:  
Esc. pawl clearance (homing latched)  
Is tab being operated before esc. operation is complete.  
Homing pawl bite on stop  
Esc. pawl bite on pins  
(Pawl release lever clearance (bouncing esc. pawl)  
Esc. pawl clearance

SWITCH ESC. LATCH



# UNEVEN LEFT HAND MARGIN

Yes  
Uneven  
By  
One Pica?

No

Yes  
Only  
When LH Margin  
Set at Zero?

No

Yes  
Can  
Carrier Be  
Pushed Into Full  
Overbank?

No

Yes  
Is a  
15 Unit Homing  
Complete Without  
Homing Latched ?  
C/R Op.

No

## CHECK:

Leadscrew for thread completely to  
left margin. (If thread is short, check  
to see if spacer is present on right  
end of leadscrew.

## CHECK:

Tab clear finger contacting nut on  
platen height eccentric stud?  
Carrier contacting LH cord pulley  
LH wiper cover contacting C-Clip  
on print shaft.  
LH cardholder washer contacting  
side frame.  
Some other physical obstruction.

## CHECK:

Carrier return unlatching (early)  
Torque limiter for excessive torque  
Carrier shoe for bind or weak spring  
Release lever to shoe arm clearance  
Leadscrew support clearance  
Shoe arm latch stop

## CHECK

For binds:

1. Escapement gear train
  2. Intermediate gear bearing
  3. Change gear shaft (end play)
  4. Pinwheel shaft (end play)
  5. Rebound governor
- Backspace holding pawl dragging  
Escapement pawl bite excessive  
Pawl release lev. clearance excessive  
Weak lead screw bias  
Change gears for bind in 1/72 pitch

HOMING IS INCORRECT  
Return operation before escapement  
completed.  
Escapement pawl entry timing  
Loose homing pawl stop  
Change gear assembly

## CYCLE CLUTCH

1. Put a resistance on the print shaft with your hand and observe that the cycle clutch still latches and does not buzz while typing several "8's".

## KEYBOARD

1. Type each character three times and observe that no character fails to print and no keylever is hard to depress.
2. Let several characters on each side of the keyboard restore slowly and observe a restoring clearance.
3. Type alternately in upper and lower case to check print-to-shift and shift-to-print interlocks.
4. With the machine running, pull up on the restoring roller and release a character and ease the roller down and make sure the character is tripped off. Try this check on each end and on each side of center of the keyboard.

## PRINT

1. Type many periods, commas and colons and observe that the ribbon doesn't fail to feed while typing low velocity characters.
2. Type several periods, I's, and M's and listen for the sound of the three different velocities.
3. Operate the repeat spacebar and observe that the ribbon doesn't feed.
4. Latch the No-Print key down, type several characters, and observe that the ribbon doesn't feed.
5. Type many upper case M's and W's using a UN-11-B type font and check for even top and bottom, even side to side, and a minimum of voids.

## ESCAPEMENT

1. Type all characters alternately in upper and then lower case several times very fast and check for any escapement failures.
2. With the machine in the 1/72 pitch type several lines of upper case M's and W's as fast as possible and check to see that all characters near the end of the line are aligned under the ones above.
3. With the pitch selector lever in the 1/72 pitch, type several characters, then move the pitch selector lever slowly forward making sure not to overthrow the 1/84 pitch position. Type several characters in the 1/84 pitch and observe that the machine did change pitches and did not skip or pile type. Follow the same procedure, moving the pitch selector lever to the 1/96 pitch position. Then follow the same procedure, moving the pitch selector lever in the other direction.
4. With the machine in the 1/96 pitch, return the carrier, then type one lower case W and one lower case M. Operate carrier return and check to see that the carrier did not bounce away from the LH margin. Repeat this check several times.

## CARRIER RETURN

1. Operate the tab several times to move the carrier to the right side of the machine. Depress the carrier return keybutton and while the carrier is moving, depress a character keybutton and observe the character is stored and does not print until the carrier comes back to the left hand margin.
2. With the machine in the 1/96 pitch, operate the carrier return, type one W and one M in lower case, operate the carrier return again and observe the carrier comes back to the LH margin with the LH margin set at zero. Repeat this check several times.
3. With the leading dial set at a low value, type an upper case I, operate carrier return, upper case I, operate carrier return at least twenty times and check to see that all I's align under the one above. Make this check in all three pitches.
4. With the leading dial set at twenty, tab to the right side of the machine. After the last tab operation depress carrier return and observe the carrier return operation latches up and the carrier returns to the LH margin.

## TAB

1. Gang clear all tab stops and check to make sure they were all cleared. Set six tab stops across the page. Operate tab and print an I in each column across the page at least ten lines in each pitch and observe all columns are aligned correctly.
2. Depress the tab locate keybutton, return the carrier, operate tab and count the operations all the way across the machine, making sure no operation fails. Operate this check at least twice across the machine.
3. With the RH margin set at position 12, set a tab stop at position 10 and tab to it and then away from it, making sure the tab does not fail to operate at this position.
4. Operate carrier return and then tab to check the catch tab operation.
5. Clear all tab stops. Move the pitch selector lever back and forth until the leadscrew bias is run down and then operate tab and observe the carrier doesn't move until several spacebars are operated.
6. Set one tab stop and tab to this position with the machine in the 1/96 pitch. Unit backspace four times, tab and observe that the carrier comes back to the same position. Put the machine in the 1/72 pitch, tab to the set tab stop, unit backspace once, tab again and observe the carrier does not stop at that set stop but goes on to the next one.

## BACKSPACE

1. Set the LH margin at zero and the RH margin at position 12. Tab the carrier to the RH side of the machine. Hold the unit backspace into a repeat operation and watch the carrier as it backspaces completely across the machine. The carrier should not hesitate, indicating a backspace failure, and the indicating tube should restore to its rest position.



2. With the machine in the 1/96 pitch, operate carrier return, unit backspace twice and then try to character backspace. Character backspace should not work. Unit backspace should be locked out even in the repeat operation after backspacing a maximum of five units into overbank.
3. With the machine in the 1/72 pitch, operate carrier return, type two M's and then unit backspace once. Type an M and unit backspace after each one until a total of eight M's have been typed. Operate character backspace and while it is backspacing strike an M. This character should be stored while it is backspacing and should back up to the second M and then strike over it. Repeat this check several times.
4. With the machine in the 1/72 pitch, operate carrier return, type four M's, then operate carrier return again. Type one M, character backspace twice and then type two M's. The first M should type in overbank and the second one should strike directly over the one at the LH margin.
5. Type a long line of MIMIMI combinations. Character backspace twice, strike over, character backspace twice, strike over, to check correct character backspacing to the limit of the pinwheel memory.

#### SPACEBAR

1. With the machine in the 1/72 pitch, the LH margin set at zero and the RH margin set at 12 run the following justification exercise:

1234567890123456	b3	1234567890123456
123456789012345	b12	123456789012345
12345678901234	o8	12345678901234
1234567890123	g6	1234567890123
123456789012	w6	123456789012
12345678901	r8	12345678901
123456778899	y2	1234566778899

#### INDEX

1. Mark one tooth on each index ratchet with a grease pencil and run the complete indexing check-out listed in the red Parts Reference Catalog, using a fast erratic carrier return operation rather than index.
2. With a sheet of paper in the machine, start with the leading dial on five and operate carrier return several times printing a character after every operation. Advance the leading dial after every group of operations and after all

values have been used, check closely for any indexing failures.

#### JUSTIFICATION

1. Try setting the RH margin many times near each end and near the center. Push left, right, up and down on the margin set lever as it is depressed and released in an attempt to loose the tube.
2. Clear all tab stops. With the RH margin set near each end and near the center latch out tab and operate carrier return repeatedly to prevent tab from going far enough to unlatch, yet allowing the carrier to pass the RH margin to check the indicator tube restoring operation.
3. With the machine in the 1/72 pitch and the LH margin set at zero, pull the justification lever clockwise into the read mode and return the carrier to the LH margin. Operate the repeat spacebar until the carrier points to 4-3/4. Check the spacebar counter on the RH end of the justification tube and it should indicate 19 spacebars. Operate this check several times and on the last few hold the justification tube from turning before operating carrier return. Slowly release the tube and observe that it returns completely to the zero position.
4. With the machine in the 1/72 pitch and the LH margin set at zero, set the spacebar value to three and the justification lever to the rest position (CCW). Return the carrier to zero and set the spacebar quantity dial to 20. Operate the repeat spacebar until the carrier position pointer points to 4-3/4 and the spacebar quantity dial should read one. Repeat this check several times to check for double step-down or failure to step down.
5. Set the spacebar value dial to nine and the spacebar quantity dial to any value other than zero. Operate the repeat spacebar until the quantity dial steps to zero and observe that the value dial steps down to eight and then stops. Set a quantity in again and repeat spacebar and observe that the spacebar value steps down to seven. Continue this sequence to check that the spacebar value steps down on all values.
6. Operate spacebar, character, spacebar, character, in both the read and the write modes to observe that the counting operation does not count characters.
7. With the machine in the 1/72 pitch and the RH margin set at position 12, tab locate to position 11 and observe the white line of the justification tube indicating 12 units in the 1/72 window of the indicating tube with the vernier adjustment centered. Also check the indicator tube for a good solid position free of sluggishness or binds.



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